New York, by George H. Williams. With this paper the author concludes for the present his elaborate petrographic studies of the extremely varied massive rocks of the "Cortlandt Series," as it has been designated by Prof. J. D. Dana. He treats in detail the gabbro, diorite, and mica-diorite varieties of norite occurring chiefly in the south-western portion of the area. —Three formations of the Middle Atlantic slope (continued), by W. J. McGee. In this concluding paper the whole subject of the Columbia formation is recapitulated, the general conclusion being that it is much older than the moraine-fringed drift-sheet of the North-Eastern States, and that while th evertebrates of its correlatives suggest a Pliocene origin, both stratigraphy and the invertebrate fossils prove that it is Quaternary. Thus the Columbia formation not only enlarges current conceptions of Quaternary time, and opens a hitherto sealed chapter in geology, but at the same time bridges over an important break in geological history, between the Tertiary and Quaternary epochs.—A comparison of the elastic and the electrical theories of light with respect to the law of double refraction and the dispersion of colours, by J. Willard Gibbs. The main object of this paper is to show the great superiority of the electric over the elastic theories of light as applied to the case of plane waves propagated in transparent and sensibly homogeneous media. The phenomena of dispersion here studied corroborate the conclusion which seemed to follow inevitably from the law of double refraction alone.—Mr. Henry J. Biddle contributes some valuable notes on the surface geology of Southern Oregon, visited by him during the summer of 1887.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 7.—"An Additional Contribution to the Placentation of the Lemurs." By Prof. Sir Wm. Turner, Knt., M.B., LL.D., F.R.S.

In 1876 the author contributed to the Royal Society a memoir "On the Placentation of the Lemurs," which was published in the Philosophical Transactions of that year (vol. clxvi. Part 2). The gravid uteri which he examined and described were from specimens of *Propithecus diadema*, *Lemur rufipes*, and *Indris brevicaudatus*.

In April of the present year he received from Mr. F. E. Beddard, Prosector to the Zoological Society of London, the gravid uterus of a Lemur, which was *Lemur xanthomystax*.

The examination of this gravid uterus confirmed the conclusions to which both Alphonse Milne Edwards[1] and the author had arrived independently from previous investigations, that the placenta in this important group of animals is diffused and non-deciduate, and that the sac of the allantois is large and persistent up to the time of parturition. In these important respects, therefore, the Lemurs, are, in their placental characters, as far removed from man and apes as it is possible for them to be.

Although the author is not disposed to attach too much weight to the placenta as furnishing a dominant character for purposes of classification, yet he cannot but think that animals which are megallantoid, non-deciduate, and with the villi diffused generally over the surface of the chorion, ought no longer to be associated in the same order with animals in which, as in the apes, the sac of the allantois early disappears, and the villi are concentrated into a special placental area, in which the fœtal and maternal structures are so intermingled that the placenta is highly deciduate. Hence he is of opinion that the Lemurs ought to be grouped apart from the Apes in a special order, which may be named either with Alphonse Milne Edwards *Lemuria*, or with Victor Carus and others *Prosimii*.

The fœtus possessed an imperfect covering, external to the hairy coat, and quite independent of the amnion, composed of a cuticular membrane. It corresponded with the envelope named by Welcker *epitrichium*, and described both by him and by the author as present in *Bradypus* and *Cholopus*. But it occurred in the fœtus both of *Lemur xanthomystax* and *Propithecus diadema* in flakes and patches, and not as a continuous envelope as in the Sloths.

Physical Society, May 26.—Mr. Shelford Bidwell, F.R.S., Vice-President, in the chair.—The following communications were read:—Note on the governing of electromotors, by Profs. W. E. Ayrton and J. Perry. In a paper read before the Society of Telegraph-Engineers in 1882 the authors deduced the conditions of self-regulation of electromotors for varying load when supplied either at constant potential or with constant current. The conditions involved "differential winding," *i.e.* the use of a shunt motor with series demagnetizing coils. With this arrangement fairly good regulation has been obtained, but owing to want of economy the methods have not been developed further. Since then another arrangement, in which a simple shunt motor is used, and a few accumulators placed in series with the armature, has been devised for working in a constant current system. By means of a suitable switch, the accumulators can be charged when the motor is at rest. On the assumption that the E.M.F. of motors is given by $E = n(p + tZ)$, where n = speed, Z = number of turns on magnets, and p and t are constants, it is shown that the speed at which a motor will govern is given by

$$n = \frac{z + a + a'}{t},$$

and the constant current

$$C = \frac{e - np}{a + a'},$$

where z and a are the resistances of the shunt and armature respectively, and e and a' the E.M.F. and resistance of the accumulators. Since a and a' may be small and np not large, the value of e need not be great to give a considerable value for C, and thus only a small number of accumulators will be required. —On the formulæ of Bernoulli and Haecker for the lifting-power of magnets, by Prof. S. P. Thompson, read by Prof. Perry. The formulæ referred to are $P \propto \sqrt[3]{W^2}$ and $P = a\sqrt[3]{W^2}$ respectively, where P = lifting-power, W = mass of magnet, and a a constant depending on the material and shape of the magnet. These formulæ, the author shows, are equivalent to saying that the lifting-power of magnets in which the magnetic induction, B, has been carried to an equal degree, is proportional to the polar surface, and that Haecker's coefficient a is proportional to B^2 through the surface. Assuming the induction uniform over the surface, it is shown that

$$P = \frac{1}{8\pi} B^2 A,$$

where A = area of surface, and this gives a very convenient method of determining B from measurements made upon the pull exerted at a given polar surface. If P be measured in kilogrammes and A in square centimetres, the formula for B becomes

$$B = 5000 \sqrt{\frac{P}{A}};$$

and if the measurements be made in pounds and inches, the constant becomes 1317. It will be readily seen that the greater power of small magnets in proportion to weight does not require for its explanation the sometimes alleged fact that small pieces of steel can be more highly magnetized than large ones, for if B be the same, the lifting-power will be proportional to the polar surface, and not to weight, and hence must necessarily be greater relatively to weight in small magnets. In the case of electromagnets for inductions between 6000 and 16,000, between which the permeability, μ, is approximately given by

$$\mu = \frac{16{,}000 - B}{3{\cdot}2},$$

the lifting-power is shown to be

$$P = A\left(\frac{3{\cdot}2\,Si}{Si + 2{\cdot}56l}\right)^2,$$

where P is in kilogrammes, A in square centimetres, Si = ampere turns, and l = mean length of the magnetic circuit.—Experiments on Electrolysis; Part ii., Irreciprocal Conduction,[1] by Mr. W. W. Haldane Gee and Mr. H. Holden. An abstract was read by the Secretary. The authors have observed, when strong sulphuric acid is used as an electrolyte, the electrodes being of platinum, that the decomposition nearly ceases, if, by decreasing the resistance in circuit, it is attempted to increase the current beyond a certain maximum. When this condition (called the insulating condition) is arrived at, reversing the current immediately restores the conductivity. Experiment shows that the current density is an important factor, and that the composition, viscosity, and temperature of the electrolyte, as well as the previous history of the electrode, have considerable influence on the current density at which the insulating condition occurs. The seat of the insulating layer is found to be at the anode; and the authors believe it due to very concentrated acid formed around the electrode, whose specific resistance is very high Experiments were also made with carbon and gold electrodes, and phosphoric acid, caustic potash, soap, and sodium benzoate were used as electrolytes, the results of which seem compatible with the concentration hypothesis above stated. The paper contains an historical and critical account of allied phenomena, and tables expressing the numerical results obtained by the authors are given.

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[1] "Histoire Naturelle des Mammifères de Madagascar," forming vol. vi. chap. ix. of Grandidier's "Histoire de Madagascar."

[1] Irreciprocal conduction is said to occur if a reversal of the direction of a current causes any change in its magnitude.

Linnean Society, June 7.—Mr. Carruthers, President, in the chair.—The following were nominated Vice-Presidents: Mr. F. Crisp, Dr. Maxwell Masters, Dr. John Anderson, Mr. C. B. Clarke.—An exhibition under the microscope of decalcified and stained portions of the test of *Laganum depressum* was then given by Prof. Martin Duncan, who made some very instructive remarks on the structural characters to be relied on for discriminating the species.—Mr. D. Morris, of Kew, exhibited some drawings of a Fungus (*Exobasidium*) causing a singular distortion of the leaves of *Lyonia*, from Jamaica.—A paper was then read, by Mr. H. N. Ridley, on the natural history of Fernando Noronha, in which he gave the general results of his investigations into the geology, botany, and zoology of this hitherto little-explored island.

Royal Meteorological Society, May 16.—Dr. W. Marcet, F.R.S., President, in the chair.—The following communications were read:—Report of the Wind Force Committee on experiments with anemometers conducted at Hersham, by Mr. G. M. Whipple and Mr. W. H. Dines. A whirling apparatus, with arms 29 feet radius, was rotated by means of a small steam-engine. On the arms of the whirler four different anemometers were placed. Each experiment lasted fifteen minutes, the steam-pressure remaining constant during the run. For the Kew standard-anemometer, with arms 2 feet long, the experiments give a mean value for Robinson's factor of 2·15; and for two smaller instruments the factor is 2·51 and 2·96. Mr. Dine's helicoid anemometer gave very satisfactory results, the mean factor being 0·996.—On the measurement of the increase of humidity in rooms by the emission of steam from the so-called bronchitis kettle, by Dr. W. Marcet, F.R.S. The author described a number of experiments which he had made by steaming a room with a bronchitis kettle, and ascertaining the rise and fall of the relative humidity from readings of the dry- and wet-bulb thermometers. He found that the air in the room could not be saturated, the relative humidity not exceeding 85 per cent.

Entomological Society, June 6.—Dr. D. Sharp, President, in the chair.—Mr. Pascoe brought for exhibition a book of fine plates of *Mantidæ*, drawn by Prof. Westwood, which it had been hoped would have been published by the Ray Society.—Mr. E. Saunders exhibited a species of Hemiptera, *Monanthia angustata*, H-S., new to Britain, which he had captured by sweeping, near Cisbury, Worthing. The insect is rather closely allied to the common *Monanthia cardui*, L.—Mr. McLachlan exhibited a species of *Halticidæ*, which had been sent him by Mr. D. Morris, Assistant Director of the Royal Gardens, Kew, who had received them from Mr. J. H. Hart, of the Botanic Gardens, Trinidad, with a note to the effect that they had attacked young tobacco and egg-plants badly in that island. Mr. Jacoby had, with some reserve, given as his opinion that it might possibly turn out to be *Epitrix fuscata*, Duv., a species which had been described from Cuba.—The Rev. H. S. Gorham exhibited a collection of beetles lately captured in Brittany including *Diachromus germanus*, L., *Onthophagus taurus*, L., *Hister sinuatus*, Ill., and other species which are exceedingly rare, or altogether wanting in Britain, and yet occur very commonly in the north of France.—Mr. White exhibited living larvæ of *Endromis versicolora*, from near Bristol, and remarked that when quite young they are nearly black, owing to being very thickly spotted with that colour; the body-colour is green, and after two or three changes of skin the spots disappear. Mr. White also exhibited two preserved larvæ of *Phorodesma smaragdaria*, which he had recently taken, and made some remarks concerning the so-called "case," which this insect is said to construct from the leaves of its food-plant, *Artemisia maritima*. This he did not consider to be really a case, but he had discovered that the larva possessed on its segments certain secretory glands, at the apex of each of which there is a bristly hair; this appears to retain pieces of the plant, which are probably fixed firmly afterwards by means of the secreted fluid. These pieces are very irregularly distributed, and their purpose does not seem quite evident.—Mr. Lewis exhibited about three hundred specimens of the genera *Hetærius*, Er., and *Eretmotus*, Mars. The most remarkable of these was *Hetærius acutangulus*, Lewis, discovered last year by Mr. J. J. Walker near Tangier, and recently taken by him at San Roche, in Spain.

PARIS.

Academy of Sciences, June 11.—M. Janssen, President, in the chair.—A study of the refrigerant mixtures obtained with solid carbonic acid, by MM. Cailletet and E. Colardeau. These researches seem to show that the ether generally used in combination with snow and carbonic acid for the purpose of obtaining intense cold, plays a much greater part than has been supposed in lowering the temperature of the mixture.—Representation of the attitudes of human locomotion by means of figures in relief, by M. Marey. The figure of a runner at a given moment is here reproduced from a relief obtained by M. Engrand by means of the photochronograph. It is pointed out that a continuous series of such figures, obtained by this process, would be of great service in determining for artists and physiologists the successive changes of attitude in running and walking.—Determination of the mean level of the sea, by means of a new instrument, by M. Ch. Lallemand. In a previous note (*Comptes rendus*, May 28, 1888) the principle was described of this apparatus, which is here figured and named the *medimaremeter*. It gives the mean sea-level without any mechanical adjustments, and almost without the need of calculations.—On the artificial reproduction of hydrocerusite, on the chemical composition of this mineral species, and on the constitution of white lead, by M. L. Bourgeois. These synthetic researches throw much light on the hitherto problematical nature of hydrocerusite, as well as on the constitution of white lead (ceruse), in which the author distinguishes only two definite substances, both existing in nature—hydrocerusite and cerusite. Analysis shows that the formula of the artificially prepared hydrocerusite is $3PbO,2CO_2,HO$, or $2(PbO,CO_2) + PbO,HO$, which is no doubt that of the natural substance also.—On the variations of the personal equation in the measurement of double stars, by M. G. Bigourdan. Thiele supposes that the personal equation of each observer remains somewhat constant during a "season of observations," and then takes a different value for another period, the duration of the "seasons" varying from a few days to several months. But according to Struve these variations are rapid, occurring in a few hours, and lasting only a single night. The observations of the author tend to show that these apparently contradictory views are capable of being reconciled, both being to a certain extent true.—On the determination of some new rings of Saturn lying beyond those already known, by Dom Lamey. These were first vaguely perceived by the author in 1868, and have been repeatedly observed since February 12, 1884, with the 16 cm. refractor in the clearer atmosphere of the Grignon Observatory. They are four in number, and are visible as well-defined elliptical rings in the regions intermediate between Mimas and Titan, first and sixth satellites of Saturn. The semi-diameter of the planet being taken as 1, the semi-diameter of the rings, measured from the middle of the most intense region, would be 2·45 ± 0·05; 3·36 ± 0·02; 4·90 ± 0·50; 8·17 ± 0·23. They were also independently observed by two of the author's fellow-workers, and cannot therefore be explained away as optical illusions due to the terrestrial atmosphere or any other sources of error.—On a point in the history of the pendulum, by M. Defforges, with remarks by M. C. Wolf. In connection with Kater's memoir of 1818, presented to the Royal Society, on the "convertible" pendulum, and his repudiation of de Prony's claim to priority of invention, M. Defforges announces the discovery of some documents in the Ecole des Ponts et Chaussées fully confirming de Prony's claim. M. Wolf, however, points out that these documents (undated, but no doubt written in 1800) were never published, and certainly unknown both to Bohnenberger when he announced the project of a pendulum with reciprocal axes (1811), and to Kater when he rejected de Prony's claim to priority of invention (1818). Hence, although de Prony now appears to have been the precursor, the rights of Bohnenberger and Kater remain intact as discoverers of the principles to which is due the revolution effected in the observations of the pendulum during the present century.—On a correction to be made in Regnault's determinations of the weight of a litre of the elementary gases, by M. J. M. Crafts. The error already pointed out by Lord Rayleigh is here corrected for air, N, H, O, and CO_2.—Experiments with a non-oscillating pendulum, by M. A. Boillot. It is shown that the oscillating pendulum, which in Foucault's experiment demonstrates the movement of the globe, may be used for the same demonstration by suppressing the oscillatory action and operating in a room.—Measurement of the velocity of etherification by means of electric conductors, by M. Negreano. A process is explained for measuring the rapidity of the chemical reactions which take place between certain resisting bodies at the moment their electric resistances become varied. These resistances have been measured according to the method indicated by Lippmann.—On a diamantiferous meteorite, which fell on September 10/22, 1886, at Novo-Urei, in the Government of Penza, Russia, by MM. Ierofeieff and Latchinoff. Analysis of this specimen, weighing 1762 gr., shows that it contains 1 per cent. of very fine carbonado, or diamond dust, besides 1·26 of amorphous carbon. The other chief substances were—peridot, 67·48; pyroxene, 23·82; and nickled iron, 5·45.

BERLIN.

Physical Society, June 1.—Prof. von Helmholtz, President, in the chair.—Dr. Lummer gave an account of experiments which he had made on the determination of the focal length of lenses by the method of Abbe in Jena. The method is based upon the equation $f = \frac{a}{\beta_1 - \beta_2}$; where f is the focal length, a the distance of two objects from the lens, and β_1 β_2 the respective magnifications of their images. The speaker discussed first the way by which Abbe had arrived at the above equation, and then went thoroughly into an explanation of the methods for measuring the amount of magnification of the images. It must suffice here to say briefly that the magnification was measured by a microscope directed along the principal axis of the lens, and at right angles to its surface, the microscope then being moved backwards and forwards, until the upper and lower ends of the image were visible. Prof. von Helmholtz explained that during his physiological-optical researches he had already determined the focal lengths of lenses by the measurements of the magnification, in accordance with the formula given above, admitting at the same time that his methods were perhaps less exact.—Dr. Lummer then gave an abstract of a paper on the movement of air in the atmosphere, which he had recently read before the Academy of Sciences. In solving the problem, he had made use of the principle of mechanical similarities. When the hydrodynamic equation for a given motion is known, it is only necessary to multiply all the factors by n in order to represent the motion in much larger dimensions. Accordingly if the conditions of the occurrence of air currents, such as take place in the atmosphere, have been experimentally determined in the laboratory for 1 cubic metre of air, and if the atmosphere is assumed to be 8000 metres high, then the space, time, and moment must be multiplied by 8000, while on the other hand the internal friction must be taken as being only 1/8000 of that which has been determined by experiment. It follows from this that the internal friction is of very small account; but as against this, the friction of the earth's surface has a considerable influence and cannot be neglected. Supposing a mass of air moving horizontally is considered, then a series of particles of air, which were at the outset vertically each above the other, will finally place themselves along a curve of sines as the result of friction at the earth's surface. Calculation shows that it would require a period of 42,000 years before the motion was reduced to one-half as the result of internal friction. The speaker then considered the atmosphere as made up of rings of air which surround the earth in coincidence with the parallels of latitude: each of these rings of air has its own moment of rotation, which depends on its radius, and is therefore greatest at the equator and least at the poles. If the air which is streaming upwards at the equator were to stream down again to the earth in higher latitudes, it would be moving with a velocity far exceeding that of any known storm, even at the latitude of 30°. Since the internal friction of the air is so small that it may be neglected, the speaker proceeded to point out the other factors which have an influence in slowing down the air as it falls. He regards them as being the vortex motions which take place in the atmosphere at the iscontinuous surfaces of two masses of air moving with different velocities. These vortex motions cause the adjoining layers of the two masses of air to mix, and thus diminish their velocity. This is the explanation of the calms, trade-winds, sub-tropical rains, and other phenomena which occur in the atmosphere. It would occupy too much space to give even a brief statement of how these conclusions are arrived at.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A Course of Practical Instruction in Botany, Part 1, 2nd edition: Prof. F. O. Bower (Macmillan).—Lessons in Elementary Mechanics, Stage 2: W. H. Grieve (Longmans).—Observations on the Embryology of Insects and Arachnids: A. T. Bruce (Baltimore).—Smithsonian Report, 1885, Part 2 (Washington).—Birdsnesting and Bird-skinning, 2nd edition: M. Christy (Unwin).—An Elementary Treatise on Mensuration: E. J. Henchie (School Books Publishing Co.)—First Elements of Experimental Geometry: P. Bert; translated (Cassell).--Introductory Inorganic Analysis: E. H. Cook (Churchill).—Origin and Growth of Religion as illustrated by Celtic Heathendom: Prof. J. Rhys (Williams and Norgate).—Sierra Leone; or the White Man's Grave: G. A. Lethbridge Banbury (Sonnenschein).—Explorations and Adventures in New Guinea: Capt. J. Strachan (Low).—Longmans' School Geography for Australasia: G. G. Chisholm (Longmans).—On the Dicotylinæ of the John Day Miocene of North America: E. D. Cope.—On the Mechanical Origin of the Dentition of the Amblypoda: E. D. Cope.—The Theory of the Tides: J. Nolan (Dulau).—The Perissodactyla: E. D. Cope (Philadelphia).—The Mechanical Origin of the Sectorial Teeth of the Carnivora: E. D. Cope (Salem).—Recent Advances in our Knowledge of the Law of Storms: F. Chambers (Bombay).—Causation of Pneumonia: H. B. Baker (Lansing).—Quarterly Journal of the Royal Meteorological Society, April (Stanford).—Quarterly Weather Report, Part 3 (Eyre and Spottiswoode).—Hourly Readings, 1885 (Eyre and Spottiswoode).—Travaux de la Société des Naturalistes de St. Pétersbourg, vol. xix. 1888, Section de Géologie et de Minéralogie (St. Pétersbourg).—Notes from the Leyden Museum, vol. x. Nos. 1 and 2 (Brill, Leyden).—Madras Journal of Literature and Science, Session 1887-88 (Madras).—Proceedings of the Academy of Natural Sciences of Philadelphia, Part 1, 1888 (Philadelphia).—Internationales Archiv für Ethnographie, Band i. Heft 3 (Trübner).

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